Date Printed: Jul 17, 2016

Experiment Safety Review Form
Review Number: PO-067-2016

PRINCIPAL INVESTIGATOR: Kenneth Sexton
GROUP: Omega
EXT: 8463 **E-MAIL: ksexton@bnl.gov** **LIFE NUMBER: 20051**

Project Title: Short Baseline Neutrino Detector, Deep Underground Neutrino Detector, Atlas
Location(s): 0510
Area(s): 0510-1-216

SIGNATURES:

Principal Investigator: Kenneth Sexton	**Date: 3/1/2016**
Experiment Review Coordinator: Ronald Gill	**Date: 3/1/2016**
Co-PI or Alternate Contact (s): Chen, Hucheng	**Date: 3/1/2016**
Reviewer: Joseph Vignola	**Date: 2/18/2016**
Reviewer: Achim Franz	**Date: 2/29/2016**
Reviewer: Mary Chuc	**Date:**
Reviewer: Frank Craner	**Date: 2/25/2016**
Approval: Laurence Littenberg	**Date: 3/2/2016**
Review/Approval (ERC) Comments: 03/01/2016 4:48 PM 03/01/2016 2:43 PM This ESR was reviewed and approved.	
Walkthrough Signature: Ronald Gill	**Date: 3/23/2016**
Next Annual Review Date: 3/2/2017	
FUA Change Required? No	
Fire Rescue Run Card Changes Required? No	
Has a NEPA Review been Performed for this Project? Yes	
Required Approvals (i.e., IACUC, IBC, etc.): None	
Project Termination Acceptance Signature: **Comments:**	**Date:**

I. Define the Scope of the Work

A. Description

All work required to perform electro/mechanical work and cryogenic testing. Voltages are typically below 50 VDC

with currents below 1 Amp, but some higher voltages may be used for detector develpment. Use of voltgaes above 50V will use supplies and cables/connectors rated for the voltage and current being used. A 250 liter transport/storage dewar and a 160 Liter open-top dewar will be used for the liquid nitrogen. Pressurized gas cylinders for argon, nitrogen and/or helium will occasionally be used for purity and leak testing.

Tasks will include construction, repair, maintenance and testing of mechanical equipement and small electronic devices.

Chemicals needed include cleaning products, solvents, glues & epoxies, sealants and soldering products.

Tasks will include construction, repair, maintenance and testing of mechanical equipement and small electronic devices.

Chemicals needed include cleaning products, solvents, glues & epoxies, sealants and soldering products.

Equipment manuals or procedures that are controlled documents:

None

B. Human Performance Factors

All pertinent safety courses and training must be kept up to date. All pertinent PPE must be on hand, inspected regularly and in good servicable condition.

C. Waste Minimization/Pollution Prevention

I keep a solder scraps can next to the soldering station, so metal scraps are captured, stored and recycled accordingly.

All chemicals and their wastes are stored, handled and used following SBMS guidelines.

D. Materials Used /Waste Generated

Materials Used	Disposal Method	Amount per Use	Amount per Year	Comments
Solder Resin Core	Recycle	0.10 lb	2.00 lb	Can labeled "Solder Scraps for Recycling" kept at solder station.
Vacuum Pump Oil 19 (Inland 19)	Industrial	8.00 oz	8.00 oz	Fresh oil containers stored in chemical cabinet. Waste oil is taken to the 90-Day Area ASAP.
Helium (3he, 99.95%+) (<0.05% 4he)	Fugitive	0.10 ft3	1.80 ft3	Only 1 K size gas bottle kept in the room at any time.
Liquid Nitrogen	Fugitive	160.00 ltr	1600.00 ltr	Yearly use is estimated. Not more than 1 250 liter transportation dewar to be in the room at any time.
Argon Compressed	Fugitive	0.10 ft3	1.80 ft3	Only 1 K size gas bottle kept in the room.
Ethanol (Reagent Alcohol, Specially Denatured Formula)	Fugitive	10.00 ml	2.00 ltr	To be used as needed for parts cleaning.
Acetone	Fugitive	5.00 ml	1.00 ltr	To be used in small quantities as needed for parts cleaning. Acetone evaporates during use, so no waste will be generated.
Epoxies	Trash	5.00 g	100.00 g	Various brands of epoxies used as needed for the experiments.
Oil General	Industrial	10.00 oz	10.00 oz	Various oils used for lubricants and machining purposes.
Grease - White Lithium (Contains Tetrachloroethylene)	Industrial	1.00 oz	20.00 oz	Lubricant
Anti-Seize	Industrial	5.00 ml	250.00 ml	To coat threaded fasteners.

Soldering Flux	Trash	0.10 oz	5.00 oz	For soldering, as needed.
Nitrogen Compressed	Fugitive	0.10 ft3	1.80 ft3	

II. Identify and Analyze Hazards Associated with the Work

The following hazards were identified:

Physical Hazards:

- Oxygen deficient atmosphere
  (Area: 0510-1-216)
- Sharps (non medical)
- Cryogens (any substance or device capable of producing temperatures <= 170K)
  (Area: 0510-1-216)
- Powered Hand Tools
- Electrical hazards >50 V, >10 J (exposed conductors, capacitors, etc)
- Compressed gases (lecture bottles, cylinders, gas lines)
  (Area: 0510-1-216)
- Soldering of electronic components
- Flammable liquids
  (Area: 0510-1-216)

Chemical Hazards:

- None

Ionizing and Non-ionizing Radiation Hazards:

- None

Biological Hazards:

- None

Offsite Work:

- None

Other Issues (Security, Notifications, Community, etc.):

- None

Significant Environmental Aspects

- Any amount of industrial waste generation (e.g., oils, vacuum pump oil)

III. Develop and Implement Hazard Controls and Assess Risk

A. Physical Hazards, Tasks and Controls

Hazard, Default Controls, Task Specific Info	Risk Level
Hazard: **Oxygen deficient atmosphere** **Default Controls:** Contact ESH Coordinator for ODH determination and associated controls. Comply with Subject Area "Oxygen Deficiency Hazards (ODH), System Classification and Controls" **Task Specific Info:** Oxygen deficient atmosphere (Area: 0510-2-85). Preliminary calculations show that the oxygen concentration will not fall below 20.5% for a dewar failure using the minimum rated air flow rate. Assuming a boil off rate that empties the 160 open top dewar in a day, and a ventilation rate (62 cfm), which is 5X lower than the specified minimum rate, the oxygen concentration does not go below 19.8%. All pertinent safety courses and training must be kept up to date. All pertinent PPE must be on hand, inspected regularly and in good servicable condition.	**Acceptable (21-40)**

Hazard:	**Sharps (non medical)** **Default Controls:** Sharps including needles, razor blades and syringes (plastic and glass) must be disposed of in sturdy, rigid, sharps containers. Sharps containers cannot be more than 2/3 full. **Task Specific Info:** Only non-medical razor blades and utility knife blades will be used. All pertinent safety courses and training must be kept up to date. All pertinent PPE must be on hand, inspected regularly and in good servicable condition.	**Negligible (0-20)**
Hazard:	**Cryogens (any substance or device capable of producing temperatures <= 170K)** **Default Controls:** General Requirements: • Evaluate location oxygen deficiency • Store/transport only in approved containers (i.e. DOT/ASME or BNL LESHC) • Never pour from above chest level • PPE: Long Sleeve Shirt (or Lab Coat), long pants (or skirt covering ankles) and closed shoes Pressurized transfer to open (vented) container; Or-Pouring > 5 liter volumes of LN2 between open containers: • Face shield along with either Safety Glasses (w/side shields) or Goggles • Gloves (Cryo or Heavy Leather) Pouring small (5 liters or less) volumes of LN2 between open containers: • Safety Goggles (face shield recommended if possible) • Gloves (Cryo or Heavy Leather) Work with samples immersed in LN2 in small (~1 liter) dewars: • Use Tongs (tools) to manipulate/handle cryogenic samples (do not touch with gloves)• Use insulated non-absorbent gloves with dexterity (cotton/nylon gloves under disposable nitrile gloves) • Safety Goggles **Task Specific Info:** At any time, not more than one 250 liter liquid cryogen transportation dewar will be in the room. Use of liquid nitrogen will be in an open top "flask" type dewar which can contain 160 liters of LN2. All pertinent safety courses and training will be kept up to date. All pertinent PPE will be on hand, inspected regularly and in good servicable condition.	**Acceptable (21-40)**
Hazard:	**Powered Hand Tools** **Default Controls:** Inspected for damage prior to use. Follow manufacturer's instructions. PPE: Safety glasses **Task Specific Info:** Powered hand tools will typically be battery operated or 120VAC hot air blowers, drill motors and/or screw drivers. All pertinent safety courses and training will be kept up to date. All pertinent PPE will be on hand, inspected regularly and in good servicable condition.	**Negligible (0-20)**
Hazard:	**Electrical hazards >50 V, >10 J (exposed conductors, capacitors, etc)** **Default Controls:**	**Negligible (0-20)**

For >50V contact ESH Coordinator
Comply with Subject Area “Electrical Safety”

Task Specific Info:

All pertinent safety courses and training will be kept up to date. All pertinent PPE will be on hand, inspected regularly and in good servicable condition.

Hazard:	**Compressed gases (lecture bottles, cylinders, gas lines)**	**Negligible (0-20)**

Default Controls:
• Any systems >15psi must be SME Approved
• Transport cylinders using a cylinder cart
• Secure cylinders to a fixed object/wall
• Use regulator, hoses, and components compatible with gas
• Use hoses and clamps rated for maximum regulator output or use pressure relief device
• Wear safety glasses with side shields when installing/removing/or adjusting regulator
• Label piping/tubing

Task Specific Info:

Typically only one compressed gas cylinder will be used at any time and it will usually be helium for vacuum leak testing purposes.

All pertinent safety courses and training will be kept up to date. All pertinent PPE will be on hand, inspected regularly and in good servicable condition.

Hazard:	**Soldering of electronic components**	**Negligible (0-20)**

Default Controls:
Engineering Controls
• Substitute non-lead solder where practical.
• Designate area (e.g. metal tray, or disposable liner).
• PPE: Safety glasses
• Waste Handling: Collect solder dross in a container labeled as "Scrap solder for recycling". (1/14)

Task Specific Info:

Soldering will be sporatic, but frequent.

All pertinent safety courses and training will be kept up to date. All pertinent PPE will be on hand, inspected regularly and in good servicable condition. A container labeled solder scraps for recycling will be kept by the solder station at all times. Wash hands after handling lead-based solder.

Hazard:	**Flammable liquids**	**Negligible (0-20)**

Default Controls:
As for chemicals, plus
Store large quantities in Flam. cabinets as required

Task Specific Info:

Usually the flammable liquids will be ethanol and/or acetone for cleaning purposes.

All pertinent safety courses and training will be kept up to date. All pertinent PPE will be on hand, inspected regularly and in good servicable condition. Use in minimum required quantities. Keep away from open flames and spark producing activiites.

B. Chemical Hazards, Tasks and Controls

None

C. Environmental Hazards, Tasks and Controls (include on/off site transportation and products/services)

Hazard, Default Controls, Task Specific Info	Risk Level
Hazard: **Any amount of industrial waste generation (e.g., oils, vacuum pump oil)** **Default Controls:** Engineering Controls • Store only compatible wastes together, in suitable containers. • Provide secondary containment for liquid wastes if potential for environmental release exists. • Keep containers closed and secured unless adding waste to container. Administrative Controls • Use a green industrial waste label, with generator's name and chemical contents (trade name/formula NOT acceptable). Label oils "Used Oil". • When full, complete and submit a Non Radioactive Waste Control Form (NRWCF) for pick up. The waste may be stored in a Satellite Accumulation Area or the 90-day area. Training: Hazardous Waste Generator (HP-RCRIGEN3) Comply with the SBMS Subject Area: "Industrial Waste". **Task Specific Info:** Industrial waste oils are generated on an infrequent basis, probably every 3 years. When waste is created, it will be moved to the Physics Department 90-Day Hazardous Waste area as soon as possible, and not stored in the laboratory.	**Negligible (0-20)**

D. Radiation Hazards, Tasks and Controls
None

E. Biological Hazards, Tasks and Controls
None

F. Offsite Work Hazards, Tasks and Controls
None

G. Other Issues (Security, Notifications to Other Organizations, Community Involvement, etc.)
None

H. Recommended Exposure Monitoring
- None

Description or comments:

I. EPHA Determination

Chemical Name	Quantity (lbs, gal)	Location (Bldg/Room#)

IV. Perform Work Within Controls

A. Recommended Training and Medical Surveillance Summary

B. Personnel Training, Qualification, and Authorization List

Employee/Guest Name	Life/Guest#	Dept	Required Training Course(s)	Signed
Kenneth Sexton	20051	PO	(HP-OSH-025) [EXPIRES: NEVER] (HP-RCRIGEN3) [EXPIRES: 11/4/2016] (TQ-COMPGAS1) [EXPIRES: 2/1/2019] (TQ-ELECT-BENCHTOP) [EXPIRES: 4/6/2017] (TQ-ODH) [EXPIRES: 10/20/2017] (TQ-TOOLSAFE) [EXPIRES: NEVER]	3/1/2016 12:00:00 AM

Elizabeth Worcester	24932	PO	(HP-OSH-025) [EXPIRES: NEVER] (TQ-ELECT-BENCHTOP) [EXPIRES: 5/20/2017]	3/8/2016 10:00:45 AM
Matthew Worcester	F9658	PO	(HP-OSH-025) [INCOMPLETE]	3/9/2016 2:18:33 PM
Shannon Glavin	K8358	PO	(HP-OSH-025) [EXPIRES: NEVER] (TQ-ELECT-BENCHTOP) [EXPIRES: 3/1/2018]	3/9/2016 2:42:26 PM
Amanda Depoian	K8544	PO	(HP-OSH-025) [EXPIRES: NEVER] (TQ-ELECT-BENCHTOP) [EXPIRES: 5/11/2018]	
Jacob Larkin	H8118	PO	(HP-OSH-025) [EXPIRES: NEVER] (TQ-ELECT-BENCHTOP) [EXPIRES: 5/10/2018]	

C. Emergency Procedures

Because cryogens will be frequently used, safety glasses, long pants and full enclosed shoes should be worn at all times. Persons using the cryogens will have the appropriate PPE on hand.

D. Transportation

Not applicable.

E. Logistical Interactions

Not applicable.

F. Termination/Decommissioning

The project will continue for at least 3 years. Additional work permits and/or changes to the ESR will be applied for as needed.

V. Provide Feedback

Work and equipement will be moved from room 2-85 to 1-216.

VI. Attachments

Attached Files:

ODH 1-216 Vacuum Fail.pdf

ODH 1-216 Normal Boiloff.pdf